

REMARKS

With the addition of new claims 17 and 18, claims 1 to 18 are currently pending in the present application. Claim 8 has been amended herein. The amendments and additions to the claims do not add new matter. Applicants request reconsideration of the patentability of the pending claims in view of the following discussion.

Claims 1-7 have been rejected under 35 U.S.C. § 102(e) as unpatentable over U.S. Published Patent Application No. 2003/0075121 to Dixon (“Dixon”).

In order to reject a claim under 35 U.S.C. § 102, the Office must demonstrate that each and every limitation is identically disclosed in a single prior art reference. See Scripps Clinic & Research Foundation v. Genentech, Inc., 18 U.S.P.Q.2d 1001, 1010 (Fed. Cir. 1991). “The identical invention must be shown in as complete detail as is contained in the claim.” M.P.E.P. § 2131.

Independent claim 1 recites steps of compressing gases within the at least one prechamber using the prechamber piston at precisely controlled times to cause auto-ignition in the at least one prechamber, the auto-ignition in the at least one prechamber producing hot gas jets and inducing auto-ignition in the cylinder by introducing the hot gas jets from the at least one prechamber into the cylinder.

As can be discerned, claim 1 calls for a first auto-ignition in the at least one prechamber producing hot gas jets which, upon being introduced, induce a second auto-ignition in the cylinder of the engine. It is submitted that because Dixon does not disclose (or even suggest) an auto-ignition in a prechamber that induces (and consequently is followed by) a second auto-ignition in the cylinder, it does not anticipate the subject matter of claim 1.

The Dixon reference teaches using a secondary cylinder and a secondary piston in the cylinder-head of a main cylinder to control a compression ratio and ignition timing. See Dixon, par. 25. A close review of this reference reveals, however, that Dixon does not teach that a first combustion in the secondary cylinder induces auto-ignition in the main chamber; instead, in the combustion process described by Dixon, only a single combustion takes place, and that single combustion takes place in the secondary cylinder. That this is so is indicated, for example, in paragraph 72 of Dixon, quoted directly below:

After the fuel air mix in the cylinder 20 ignites and there is combustion, there is movement of the combustion gasses down the passage 40. There can be sufficient area at the blade or the blade can be moved slightly to provide area to permit the

commencement of flow of gas into the clearance volume. The blade will thus have a throttling effect and restrict the pressure under which the combustion gasses are fed to the clearance volume and thus to the head of the piston. *As the pressure in the combustion chamber reduces, the blade commences to open to permit more ready flow of the gasses to the clearance volume to act on the piston 31.*

(Dixon, par. 74).

This passage makes clear that the hot, high-pressure gases released after combustion in the secondary cylinder (combustion volume (20)) are throttled and then act directly on the main piston in the main cylinder. In other words, the gases released from the combustion volume do not induce a secondary auto-ignition of the gases in the main cylinder chamber. Instead, as noted, the gases released from the secondary cylinder actually perform the work of the engine by acting on the piston of the main cylinder.

In light of the clear distinction between the claimed subject matter and the teachings of the Dixon reference, it is submitted that claim 1 and its dependent claims 2-7 are not anticipated by Dixon.

Withdrawal of the rejection of claims 1-7 under 35 U.S.C. § 102(e) is therefore respectfully requested.

Claims 8-16 have been rejected under 35 U.S.C. § 103(a) as unpatentable over Dixon in view of U.S. Patent No. 5,826,558 to Kawamura (“Kawamura”).

In rejecting a claim under 35 U.S.C. § 103(a), the Examiner bears the initial burden of presenting a prima facie case of obviousness. In re Rijckaert, 9 F.3d 1531, 1532, 28 U.S.P.Q.2d 1955, 1956 (Fed. Cir. 1993). To establish prima facie obviousness, three criteria must be satisfied. First, there must be some suggestion or motivation to modify or combine the reference teachings. In re Fine, 837 F.2d 1071, 5 U.S.P.Q.2d 1596 (Fed. Cir. 1988). This teaching or suggestion to make the claimed combination must be found in the prior art and not based on the application disclosure. In re Vaeck, 947 F.2d 488, 20 U.S.P.Q.2d 1438 (Fed. Cir. 1991). Second, there must be a reasonable expectation of success. In re Merck & Co., Inc., 800 F.2d 1091, 231 U.S.P.Q. 375 (Fed. Cir. 1986). Third, the prior art reference(s) must teach or suggest all of the claim features. In re Royka, 490 F.2d 981, 180 U.S.P.Q. 580 (C.C.P.A. 1974).

Independent claim 8, as amended, recites a system for homogeneous combustion jet ignition in an internal combustion engine cylinder that includes at least one prechamber

having a prechamber piston coupled to the cylinder via at least one microvalve and an electronic control unit which receives data regarding requested load demand and current operating parameters within the cylinder and is configured to control the prechamber piston and the at least one microvalve based on the received data so as to induce an auto-ignition within the at least one prechamber, *wherein, upon auto-ignition in the at least one prechamber, hot gas jets are supplied to the cylinder from the at least one prechamber to induce auto-ignition in the cylinder.*

As discussed above with respect to claim 1, the Dixon reference does not disclose inducing an auto-ignition in a cylinder by introduction of hot gases arising from an auto-ignition in at least one prechamber. The Kawamura reference does not cure the deficiency of the Dixon reference in this respect because it also does not disclose or suggest this feature. In particular, Kawamura does not disclose or suggest an *auto-ignition in the cylinder* after a first auto-ignition in the subcombustion chamber. Rather, in Kawamura, fuel is injected solely into the subcombustion chamber (see Kawamura, col. 3, lines 42-48), and the fuel-air mixture *from the subcombustion chamber* is blown into the main cylinder where it is combusted. See Kawamura, col. 4, lines 26-30. Thus, Kawamura does not use hot gases from the subcombustion chamber to cause auto-ignition of a fuel/air mixture already in the cylinder. Rather, Kawamura only uses the subcombustion chamber to boost a compression ratio of air in the cylinder by separating fuel and air during the compression process, confining all the fuel into the subcombustion chamber and consequently using only a single using single auto-ignition in the said subcombustion chamber. It is therefore emphasized that Kawamura, like Dixon, does not disclose or suggest two distinct auto-ignition stages.

For at least the foregoing reasons, it is submitted that the combination of Dixon and Kawamura fail to disclose or suggest each of the features of independent claim 8 and its dependent claims 9-16.

Withdrawal of the obviousness rejection of claims 9-16 is therefore respectfully requested.

New claim 17 recites features analogous to those of claim 8 and recites the additional features that the at least one prechamber is substantially smaller than the cylinder and a majority of fuel to be combusted is injected into the cylinder. Neither of the cited references, taken alone or combined, disclose these features of claim 17. In particular, in both the Dixon and Kawamura references, the majority of fuel is injected into the

respective prechambers rather than into the main cylinder. It is therefore submitted that new claim 17 and its dependent claim 18 are patentable for these additional reasons as well.

CONCLUSION

In view of all the above, it is believed that claims 1-18 are in allowable condition. It is therefore respectfully requested that the rejections be reconsidered and withdrawn, and that the present application issue as early as possible.

Respectfully submitted,
KENYON & KENYON

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By: Howard Grossman
Howard I. Grossman
Reg. No. 48,673

One Broadway
New York, New York 10004
Phone: (212) 425-7200
Fax: (212) 425-5288

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